

**IN THE UNITED STATES COURT, EASTERN DISTRICT OF NEW YORK**

**RE: BARBARA SCHWAB, ET AL. V. PHILIP MORRIS INC., ET AL.**

**CASE NO. CV-0401965**

**EXPERT REPORT OF  
JAMES J. HECKMAN  
May 25, 2006**

## **I. OVERVIEW AND SUMMARY**

### **A. Qualifications**

1. I am the Henry Schultz Distinguished Service Professor of Economics in the Department of Economics at the University of Chicago. I also have part-time appointments at University College London, University College Dublin and Peking University, China. I also have served on the faculties of the Department of Economics at Columbia University and Yale University. At Yale, I was the A. Whitney Griswold Professor of Economics. I received my B.A. (summa cum laude) in mathematics from Colorado College in 1965 and my M.A. and Ph.D. in economics from Princeton University in 1968 and 1971, respectively.

2. I specialize in the fields of Labor Economics, Microeconomics and Econometrics, which is the application of statistical techniques to economic problems. In particular, I have made significant contributions to the statistical techniques used to evaluate the consequences of choices and the choices people make. Indeed, much of my life's work has focused on accurately measuring actual effects of various policies on choices and outcomes.

3. In 1983, I received the John Bates Clark Medal awarded biannually by the American Economic Association to the most distinguished economist under the age of 40. In 2000, I was awarded the Nobel Prize in Economics. I am a Member of the National Academy of Sciences, a Fellow of the American Academy of Arts and Sciences, a Fellow of the Econometric Society, a Fellow of the American Statistical Association, a Fellow of the Society of Labor Economists, and a Senior Research Fellow of the American Bar Foundation. I am also a Research Associate of the National Bureau of Economic Research and I direct the Economics Research Center at the Department of Economics at the University of Chicago. I also direct the Center for Social Program Evaluation at the Harris School at the University of Chicago.

4. I have published over two hundred articles in scholarly journals and compendia. I currently serve as an Associate Editor of the Journal of Labor Economics, Econometric Reviews, and the Journal of Population Economics. I previously have served as Co-Editor of the Journal of Political Economy and as an Associate Editor of Evaluation Review, the Journal of Econometrics, the Review of Economic Studies, the Journal of Economic Perspectives, and the Review of Economics and Statistics. In addition to my academic experience, I have served as an advisor to the World Bank, the Inter-American Development Bank, the United States Department of Labor, the Ministry of Fiscal Equity of Argentina and government agencies and non-governmental organizations in Brazil, Taiwan, South Korea, Germany, Scotland and Ireland. I also have presented testimony before committees of the United States Congress. I have offered expert testimony in *Blue Cross and Blue Shield of New Jersey, et al. v. Philip Morris, Inc., Falise, et al. v. American Tobacco Co., et al.* and in *United States v. Philip Morris, et al.* within the last five years. A copy of my curriculum vitae is attached as Exhibit A to this disclosure. A list of reliance materials is attached as Exhibit B.

**B. Task and Conclusions**

5. I have been asked by counsel for Lorillard, Philip Morris USA, RJ Reynolds, and Brown & Williamson to evaluate the reliability, as a basis for estimating the Class's damage, of the methodologies and conclusions presented by Dr. Hauser in his report dated December 19, 2005 ('Hauser Report') and by Dr. Harris in his report dated September 6, 2005 ('Harris Report').

6. I understand that the Class alleges that the defendant tobacco companies engaged in a conspiracy to misrepresent the health risks of smoking 'light' cigarettes relative to the health risks of smoking 'regular' cigarettes and, as a consequence, its members were injured.

7. In his report, Dr. Hauser presents an analysis that purports to measure how much class members' 'willingness-to-pay' for 'light' cigarettes would have fallen had they been accurately informed about the health risks of smoking 'light' cigarettes relative to smoking 'regular' cigarettes. Although Dr. Hauser does not put forward a precise estimate of Class damages, his willingness-to-pay results form the basis of Dr. Harris's estimates of Class damages.<sup>1</sup>

8. For the reasons I discuss in detail in this report, I conclude to a reasonable degree of scholarly certainty that the methodologies and conclusions presented by Dr. Hauser and Dr. Harris do not provide a reliable basis for estimating damage to the Class resulting from the alleged 'light cigarette fraud' (i.e., the alleged misrepresentation of the health risks of 'light' cigarettes). I summarize those reasons briefly here:

- a. **Dr. Hauser and Dr. Harris do not rely on actual market data, but instead on responses to hypothetical questions, which are unreliable predictors of real-world behavior.**

9. As I explain in Section II below, survey responses to hypothetical questions suffer from well-known limitations that restrict their ability to reliably predict actual consumer behavior. When making choices in real-world markets, consumers must pay for the choices they make. As a result they have a stake in making accurate choices. However, responses to hypothetical questions, such as those elicited and employed by Drs. Hauser and Harris, are derived either from survey respondents' answers to hypothetical questions or from choices made from a limited and hypothetical set of alternatives, where respondents face no adverse consequence from answering or choosing

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<sup>1</sup> Dr. Hauser's analysis also underlies in part the opinions with respect to damages that Dr. Beyer expresses in his December 19, 2005 expert report. As a result, Dr. Beyer's damage estimates reflect these same flaws.

incorrectly. As a result, their stated responses and choices can be highly unreliable for projecting how consumers actually would behave in the real world.<sup>2</sup>

**b. The methodologies that Dr. Hauser and Dr. Harris apply to these surveys lead to biased results that further flaw their analyses.**

10. In order to reduce the likelihood of ‘respondent wear-out,’<sup>3</sup> Dr. Hauser limits the number of options among which respondents are asked to choose. The inclusion of only a few product characteristics and consumption alternatives among those options limit participants to a set of choices that do not accurately reflect the choice set that would be available in the real world. Hence, the decisions respondents make under this deliberately limited choice set provide little information on choices that would likely be made in the real world.

11. In addition, the identification and inclusion of only four cigarette characteristics potentially lead respondents to overstate the importance of these characteristics. This phenomenon is known in the literature as ‘framing’. Further, the artificial limitation on the variations even within those limited characteristics (e.g., ‘50 percent price reduction’, ‘20 percent price increase’) may indicate to respondents that this is the only reasonable range from which to choose. This phenomenon is known as ‘anchoring’. Finally, respondents also may associate variations in some included characteristics, like ‘taste’, with variations in other excluded characteristics, like ‘image’. As a result, the imputed value for taste would also include the value for image, which biases the estimates.

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<sup>2</sup> The respondents to Dr. Hauser’s hypothetical choice survey devoted limited time to making their decisions. His data show that 75 percent completed the survey in less than 15 minutes and only 10 percent took more than 21 minutes.

<sup>3</sup> Hauser Report, at 10, n.9.

- c. Dr. Hauser's analysis yields flawed estimates of willingness-to-pay that are inconsistent with respondents' pre-survey stated beliefs and preferences.**

12. Dr. Hauser's resulting imputations of value frequently contradict the beliefs and preferences that respondents' expressed prior to making their choices. Moreover, contrary to economic theory, Dr. Hauser's 'partworth' estimates impute a high willingness-to-pay for the allegedly misperceived reduced risk associated with 'light' cigarettes, even for respondents who stated that they perceived no such reduced risk. That is, Dr. Hauser predicts that these consumers are willing to pay even though they believe that they would receive no benefit. This result indicates that Dr. Hauser's partworth estimates not reliable.

- d. Dr. Harris's damage calculations are based on Dr. Hauser's unreliable estimates and thus lead to flawed damage estimates.**

13. In several instances, Dr. Harris's implementation of Dr. Hauser's methodology not only contradicts respondents' expressed preferences before the survey, but indicates that consumers prefer poorer health outcomes or are indifferent between lower and higher cigarette prices. Neither is a plausible result. Hence, Dr. Harris's application of Dr. Hauser's estimates yields large 'damage estimates' even for respondents who state that they believe smoking 'light' cigarettes is at least as risky as smoking 'regular' cigarettes, and thus were not misled by the alleged 'light cigarette fraud'. A reliable measure of willingness-to-pay for perceived health benefits of 'light' cigarettes would produce estimates of zero for consumers who already believe there are no health benefits from smoking 'light' cigarettes, because such respondents cannot have been misled by the alleged 'light' cigarette fraud. The fact that Dr. Harris's estimates yield large positive willingness-to-pay values among consumers who think that there are

no health benefits associated with 'light' cigarettes demonstrates the unreliability of his approach.

14. The remainder of this report is organized as follows. Section II addresses the problems that arise with hypothetical choice methodologies generally, and with Dr. Hauser's use of conjoint analysis specifically. Section III reviews Dr. Hauser's results and discusses their internal inconsistencies as well as their inconsistencies with economic theory. Section III also addresses how the unreliability of Dr. Hauser's results affects Dr. Harris's estimates of Class damage. Section IV addresses other issues with Dr. Harris's estimates of Class damage. Even if Dr. Harris's methodology gave rise to accurate estimates, which it does not, it would provide only a measure of how much increased value 'light' cigarette smokers were mistakenly led to believe they were enjoying, but not how much more they spent on 'light' cigarettes as a result. That latter determination requires an analysis of market dynamics that Dr. Harris does not even attempt to address.

## **II. DATA DERIVED FROM SURVEY RESPONSES TO HYPOTHETICAL QUESTIONS CAN BE UNRELIABLE FOR PROJECTING ACTUAL CONSUMER BEHAVIOR**

15. Economists typically employ observed transactions data from real markets and actual trading situations to estimate likely consumer preferences. However, such data are not always available; for example, when projecting consumer demand for an environmental benefit that is not actually traded in the marketplace or for a proposed product innovation. In such instances, economists may instead employ survey and estimation techniques in an attempt to measure consumer 'willingness-to-pay'. Dr. Hauser has relied on one of these techniques, Choice Based Conjoint analysis ('CBC') to impute the value that 'light' cigarette smokers place on their alleged perception that smoking 'light' cigarettes creates less health risk than smoking 'regular' cigarettes.

16. Estimation methods based on responses to hypothetical questions have many inherent flaws and, as a result, can be notoriously unreliable for projecting actual consumer behavior. As I will explain below, the CBC method that Dr. Hauser has adopted was designed to address some of these flaws; however it does not correct for all of them. Evidence that the results of Dr. Hauser's analysis, in particular, are flawed and unreliable is provided by the fact that Dr. Hauser's methodology produces a very high estimate of respondent willingness-to-pay to move from the perceived riskiness of 'regular' cigarettes to the perceived riskiness of 'light' cigarettes even when survey respondents state that they don't believe there to be *any difference in riskiness* between 'light' and 'regular' cigarettes.

**A. Hypothetical Surveys**

17. Before addressing Dr. Hauser's particular hypothetical analysis, it is useful to consider the costs and benefits of such methods generally. One of the benefits of such methods is that in some circumstances analysts can use them to elicit values where no revealed preference data exist, e.g., to predict demand for potential product improvements, in order to determine whether the improvements would be profitable to develop. In such a case, it is sometimes possible to determine whether the predictions from the hypothetical survey were accurate: if introduced, the product's predicted success can be compared to its actual success. But comparison to actual consumer response is possible only for those product improvements that are implemented; there is no opportunity to evaluate the accuracy of the predictions for those product improvements that never make it to market because they were projected to be unprofitable.



18. One of the early uses of hypothetical surveys by economists was to value public environmental amenities, like trout fisheries, which typically are not bought and sold in conventional markets. However, these surveys frequently produced willingness-to-pay estimates that defied common sense. For example, a study by Daniel Kahneman, winner of the 2002 Nobel Prize in economics, found that the responses of one group of survey participants yielded estimates of willingness-to-pay to preserve fish in *one* lake in Ontario that were not substantially lower than another group's estimated willingness-to-pay to preserve fish *in every single lake* in Ontario.<sup>4</sup> Similarly, a study by Diamond et al. found that stated willingness-to-pay to prevent logging in wilderness areas was roughly the same whether one, two, or three threatened areas would be preserved.<sup>5</sup>

19. The results of many of these early hypothetical surveys were called into question because they violated some of the basic assumptions of the economic model of consumer behavior, i.e., that people have well-ordered preferences that do not vary with the order in which questions are asked or the number of questions asked. A 1994 article by Diamond and Hausman refers to a report by Tolley et al., undertaken for the Environmental Protection Agency, which found that reported willingness-to-pay to preserve the visibility of the Grand Canyon was five times higher if survey respondents

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<sup>4</sup> "Comments by Professor Daniel Kahneman," in Cummings, R. G., *Valuing Environmental Goods: An Assessment of the Contingent Valuation Method* (1986), 185, 190-191.

<sup>5</sup> Diamond, Peter A., Jerry A. Hausman, Gregory K. Leonard, and Mike A. Denning, "Does Contingent Valuation Measure Preferences? Experimental Evidence", in Hausman, Jerry, editor, *Contingent Valuation: A Critical Assessment*, Amsterdam: North Holland Press (1993), 60. See also Desvousges, William H., et al., "Measuring Natural Resource Damages with Contingent Valuation: Tests of Validity and Reliability" in Hausman, Jerry, editor, *Contingent Valuation: A Critical Assessment*, Amsterdam: North Holland Press (1993), 100-101, which found that survey respondents had the same willingness-to-pay to preserve 2000, 20,000, and 200,000 birds.

were asked to value *only* the Grand Canyon than if they were asked to value other views first.<sup>6</sup> Diamond and Hausman also cite a study which found that respondents tended to indicate a lower willingness-to-pay for the preservation of seals when asked about preserving whales first.<sup>7</sup>

20. How well do the estimates that arise from these surveys predict actual consumer behavior? How well do answers to hypothetical questions reflect the actual choices that consumers would make if they faced the consequences of their decisions? Some studies have managed to elicit both a hypothetical valuation and an actual valuation, and a number of these have shown that the two valuations often differ by enormous amounts. For example, Brown et al. asked survey participants how much they would be willing to donate to support the removal of unused roads from the Grand Canyon's northern rim.<sup>8</sup> The hypothetical donations exceeded actual donations (solicited from the same respondents) by factors of four and six. Cummings, Harrison, and Rutstrom

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<sup>6</sup> Tolley, George, et al., "Establishing and Valuing the Effects of Improved Visibility in the Eastern United States", Report to the Environmental Protection Agency, Washington, D.C., 1983. Cited in Diamond, Peter A., and Jerry A. Hausman, "Contingent Valuation: Is Some Number Better than No Number", 8 *Journal of Economic Perspectives*, (1994), 45-64, 49.

<sup>7</sup> "Since whales are generally more popular than seals, respondents were reluctant to behave more benevolently towards seals compared with humpback whales." Samples, Karl C., and James R. Hollyer, "Contingent Valuation of Wildlife Resources in the Presence of Substitutes and Complements", in Johnson, Rebecca L. and Gary V. Johnson, editors, *Economic Valuation of Natural Resources: Issues, Theory and Applications*, Boulder: Westview Press (1990). Cited in Diamond and Hausman, id. at 49.

<sup>8</sup> Brown, Thomas C., Patricia A. Champ, Richard C. Bishop, and Daniel McCollum, "Which Response Format Reveals the Truth about Donations to a Public Good?" 72 *Land Economics* (1996) 152-166, 155. The authors used both a dichotomous-choice format, which involves the subject answering yes or no to the question "Would you pay X for good Y?", and an open-ended format, in which the subject simply states how much he or she would pay for good Y. The difference between hypothetical and actual donations was largest for the dichotomous choice format.

conducted experiments in which subjects were asked whether, hypothetically, they would purchase one of several items (a juicer, chocolates, a calculator) at specified prices, and then subsequently were given the opportunity to actually purchase at those prices. The hypothetical purchases exceeded the actual purchases by as much as ten to one.<sup>9</sup> In short, the external validity of these approaches is limited, because “[t]hey provide little incentive to consumers to truthfully reveal their WTP [willingness-to-pay]...”<sup>10</sup>

**B. Dr. Hauser’s Reliance on Conjoint Analysis**

21. Dr. Hauser has relied on a particular response to hypothetical questions elicitation technique, Choice Based Conjoint analysis (‘CBC’), to impute the value that ‘light’ cigarette smokers receive from (allegedly) believing that smoking ‘light’ cigarettes creates less health risk than smoking ‘regular’ cigarettes. Dr. Hauser develops a survey of ‘light’ cigarette smokers and then employs CBC to impute the value that consumers place on the alleged perceived health benefits of ‘light’ cigarettes.

22. Participation in Dr. Hauser’s survey was limited to self-identified current ‘light’ cigarette smokers, who were asked to choose which, among hypothetical alternative variations of the cigarettes they currently smoked, they would be ‘most likely to purchase’. The alternatives varied in only four product attributes: price, health risk,

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<sup>9</sup> Cummings, Ronald G., Glenn W. Harrison, and E. Elisabet Rutstrom, “Homegrown Values and Hypothetical Surveys: Is the Dichotomous Choice Approach Incentive-Compatible?” 85 *American Economic Review* (1995) 260-266. See also Neill, Helen R., Ronald G. Cummings, Philip T. Ganderton, Glenn W. Harrison, and Thomas McGuckin, “Hypothetical Surveys and Real Economic Commitment”, 70 *Land Economics* (1994) 145-154.

<sup>10</sup> Wertenbroch, Klaus, and Bernd Skiera, “Measuring Consumers’ Willingness-to-pay at the Point of Purchase”, 39 *Journal of Marketing Research* (2002) 228-241, 229. See also Braden, John B., Charles D. Kolstad, and David Miltz, “Introduction” in Braden and Kolstad, editors, *Measuring the Demand for Environmental Quality*, Amsterdam: North-Holland. (Quoted in Neil et al., id. at 145).

‘taste’, and pack type (hard versus soft). Only the last attribute – pack type – could be objectively described. The other three attributes were described solely in relative terms e.g., tastes like [the respondent believes] a ‘regular’ cigarette tastes, is as risky as [the respondent believes] a ‘light’ cigarette is, costs 20 percent more than [the respondent’s] ‘usual’ cigarette price.

23. The 627 survey respondents, each of whom was paid \$5 to participate, were asked a number of demographic questions, as well as questions about their perceived preferences, prior to being presented (on a computer screen) with hypothetical cigarette products containing varying mixes of these attributes and being asked to choose among them. Dr. Hauser then used statistical techniques to estimate the willingness of respondents to trade off one product attribute for another (e.g., ‘taste’ for ‘safety’) and, on the basis of these estimated hypothetical tradeoffs, Dr. Hauser calculated how much utility each respondent attached to each product attribute.

24. Conjoint analysis has been widely employed by marketing researchers to identify product attributes that consumers value most. Conjoint analysis was designed to avoid some of the problems associated with the survey methods discussed above (which typically involve simply asking respondents how much they would be willing to pay to save natural resources or help the poor) by eliciting values indirectly through registering choices in a hypothetical setting.

25. However, like other willingness-to-pay elicitation tools, the ability of conjoint analysis to elicit accurate consumer preferences depends critically on the validity of the survey design. In a 1986 article, Daniel McFadden, my Nobel co-laureate, who also was cited for his contributions to the economics of consumer choice, wrote:

A number of problems may invalidate market forecasts constructed from conjoint data . . . Sensitivity of results to such factors as experimenter/subject interaction, verbal versus written task instructions, level and method of subject compensation, presence of human observers or consultants, recall of past responses, or verbal versus key response would suggest that *preferences are not being measured accurately enough to construct market forecasts.*<sup>11</sup> [emphasis added]

26. Although Dr. Hauser has designed his analysis to address some of these problems,<sup>12</sup> he has not been able to correct for all of them, specifically the problems of framing and anchoring that I discussed in Section I. Nor has he tested whether alternative procedures, compensation, wording, etc., would produce different results.

27. In his Nobel speech, McFadden addresses the use of conjoint analysis for eliciting *stated* preferences:

[C]onjoint analysis, a method for eliciting stated preferences within a classical experimental design, provides data that *with proper consumer training and allowance for cognitive illusions* can add considerably to the ability to predict consumer decisions... [emphasis added]

There will always be questions about how closely cognitive tasks in a hypothetical setting can match those in a real decision-making environment.<sup>13</sup>

28. As I already have explained, the principle question for economists is how well the survey estimates based in hypothetical choices predict actual consumer behavior.

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<sup>11</sup> McFadden, Daniel, "The Choice Theory Approach to Market Research," 5 *Marketing Science* (1986) 275-297, 289. Similar cautions are voiced in Yoo, Dong-il, and Hiroshi Ohata, "Optimal Pricing and Product Planning for New Multiattribute Products Based on Conjoint Analysis", 38 *International Journal of Production Economics*, (1995) 245-253, 245, and Lloyd, Andrew J., "Threats to the Estimation of Benefits: Are Preference Elicitation Methods Accurate", 12 *Health Economics* (2003) 393-402.

<sup>12</sup> For example, Dr. Hauser implements a computer aided survey, which limits the potential problem of experimenter/subject interaction and randomizes the order in which choice sets are presented to respondents, which limits possible bias from the ordering of the questions.

<sup>13</sup> Daniel L. McFadden, "Economic Choices", Nobel Prize Lecture, December 8, 2000, reprinted in *Amer. Econ. Rev.* (2001) 330-365, 373.

Choice analysis that relies on stated preferences (i.e., hypothetical choices) instead of revealed preferences (i.e., actual choices), including conjoint analysis, is susceptible to a number of underlying problems that can lead both to biased and unreliable predictions of actual consumer behavior.

29. First, as I previously noted, conjoint analysis operates in the realm of the hypothetical. When consumers make actual instead of hypothetical purchase or investment decisions, they suffer [enjoy] the consequences of those decisions. Conjoint analysis does not avoid the problem that respondents answer hypothetical questions and face no consequences, good or bad, if they answer inaccurately or misrepresent their own preferences. Conjoint analysis does not study choices of consumers in real world settings.

30. Second, conjoint analysis may produce biased results because of phenomena known as ‘framing’ and ‘anchoring’. Framing occurs when the questions asked or the selection of the characteristics embodied in the choices offered to the respondent focus attention on specific aspects of choice that could potentially misrepresent their significance in real world settings. Because the AMS survey on which Dr. Hauser relies focuses on only four cigarette product characteristics, one of which is health risk, it may actually raise respondents’ sensitivity to health risks in a way that wouldn’t necessarily happen in a survey that offered choices over ten or twenty characteristics.<sup>14</sup> Anchoring occurs when responses are suggested by the choices offered. For example, Dr. Hauser’s decision to restrict the price variation choices offered to survey respondents to 50 percent and 20 percent above and below the price they currently pay, despite the critical

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<sup>14</sup> “Comments by Professor Daniel Kahneman,” in Cummings, R. G., *Valuing Environmental Goods: An Assessment of the Contingent Valuation Method* (1986), 185.

importance of variations in price to Dr. Hauser's ability to impute valuation, may result in just such an anchoring problem. The ability to reliably estimate the relationship between consumer demand and price with such large gaps between dichotomous price choices is questionable. As Ratcliffe writes in a review of conjoint analysis-based health care valuation estimates:

[L]evels chosen for the cost attribute are likely to be highly influential in determining the maximum and minimum WTP [willingness-to-pay] values elicited.<sup>15</sup>

31. Furthermore, and perhaps even more troubling, Dr. Hauser's survey respondents were required to choose one of the hypothetical alternatives they were offered; they were not permitted either to express indifference or to choose "none of the above."

The theory of demand requires that consumers have the option not to purchase, not to consume, or not to choose, leading to a variety of thorny issues regarding interpretation of preferences elicited from traditional CA tasks. . . . CA and CBCA that do not include the option to choose none of the offerings not only are inconsistent with economic demand theory, but it also is not obvious how one should sample from target populations to avoid sample selection bias and obtain unbiased, interpretable, meaningful utilities or preferences.<sup>16</sup>

32. A third problem may arise from the small number of independent observations Dr. Hauser has for each individual respondent. Essentially, Dr. Hauser imputes 16 individual respondent-specific partworths on the observation of only 16 choices across four items by each individual respondent. Because of the limited amount of

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<sup>15</sup> Ratcliffe, Julie, "The Use of Conjoint Analysis to Elicit Willingness-To-Pay Values", 16 *International Journal of Technology Assessment in Health Care* (2000) 270-290, 273.

<sup>16</sup> Louviere, Jordan J., Thomas C. Eagle, and Steven H. Cohen, "Conjoint Analysis: Methods, Myths, and Much More", CenSoC Working paper No. 05-001 (2005) at 15.

information, very different combinations of partworths could potentially generate the same observed pattern of choices for any individual respondent. For this reason, any particular vector of partworths may be a poor measure of the individual's specific preferences, even when these estimates on individual cigarette characteristics reasonably map into the respondent's hypothetical choices. Dr. Hauser claims his estimates are valid because they reasonably map into the respondents' hypothetical choice sets; however, his estimated values depend on precise estimates of the *individual* partworths, not simply on how well they jointly predict choices. As a result, his projected 'values' may be seriously biased. In addition, predicting hypothetical choices is not the same as predicting actual choices in real markets.

33. A further problem with Dr. Hauser's CBC survey is that it is not random, as it is limited to respondents who are current 'light' cigarette smokers and who choose to participate in the survey -- in economists' jargon a 'censored sample'. Even if one could accurately map preferences within this censored sample, it would not necessarily reflect the preferences of all potential consumers. For example, it would not provide a reliable guide for who is likely to start smoking. As a result, the preferences elicited by the analysis would be biased and would yield a biased estimate of the demand-side of a market equilibrium that sets price.

34. Moreover, Dr. Hauser is inconsistent in his application of regression methods. Although Dr. Hauser's estimates are derived under a Bayesian approach, and thus rely on both test results and prior information to develop distributions for model parameter values, he employs statistical methods developed under the assumption of random and repeated trials (the classical approach) to test the statistical significance of his



estimates. The reliance on the classical approach to infer confidence intervals contradicts the Bayesian methodology employed to develop these estimates. Dr. Hauser is deriving estimates under a specific set of assumptions; thus using alternative assumptions to evaluate statistical significance leads to unreliable inferences (if his initial set of assumptions is valid).<sup>17</sup>

35. A number of studies provide evidence that the results of conjoint analysis are sensitive to the particular statistical model employed.<sup>18</sup> For example, Skjoldborg and Gyrd-Hansen estimate a number of conjoint analysis models for preferences regarding hospitals and health-care systems, and conclude, “the results of conjoint analysis are sensitive to the modeling framework applied.”<sup>19</sup> Dr. Hauser employs a Hierarchical Bayes model and a heterogeneous multinomial logit model, presumably because they are easy to manipulate. However, without testing the sensitivity of the results generated to the model employed, one cannot determine whether or not these models yield accurate estimates.

36. Omitted variable bias may raise further serious problems in connection with conjoint analysis. If a subject cares about a product attribute that is excluded from the analysis, the subject may implicitly link that excluded attribute with one of the included attributes when he or she rates a choice, thus making it impossible to determine

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<sup>17</sup> Model selection under a Bayesian framework has different procedural requirements (than used by Dr. Hauser), as discussed in “Bayesian Statistics and Marketing”, Peter Rossi, Greg Allenby and Robert McCulloch, 2005, Wiley, Chapter 6.

<sup>18</sup> See, e.g., the studies cited in Herfert, Matthias, and Pierfrancesco La Mura, “Estimation of Consumer Preferences via Ordinal Decision-Theoretic Entropy”, working paper no. 64, Leipzig Graduate School of Management (2004).

<sup>19</sup> Skjoldborg, Ulla Slothuus, and Dorte Gyrd-Hansen, “Conjoint Analysis: The Cost Variable: An Achilles’ Heel?” 12 *Health Economics* (2003) 479-491, 490.

exactly how much the subject values the included attribute.<sup>20</sup> Dr. Hauser's analysis is limited to four cigarette attributes: taste, price, perceived health risk, and pack type (hard versus soft). He never establishes the centrality of these four attributes to his analysis of smokers' choice. In particular, he ignores other attributes that may matter to smokers as much or more than these four. For example, flavor (menthol/non-menthol), brand image, length of the cigarette and the nature of the filter may significantly influence purchasing decisions, especially when compared to pack type, which appears to have only a small effect on respondents' choices. If any of these (or other) excluded factors is associated in a respondent's mind with one of the four included factors, the respondent's answers will be a biased description of actual choice situations.

37. Dr. Hauser's application of conjoint analysis is based on the very strong formal assumption of additive preferences, i.e., the incremental utility a consumer derives from changes in one of the product's attributes is independent of his/her preferences for the product's other attributes. A number of researchers have described situations in which the assumption of additive preferences is problematic, especially when seeking to estimate market values.<sup>21</sup>

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<sup>20</sup> "If the attributes selected exclude attributes that are actually used . . . then one will have spurious data on preferences and trade-offs, and a meaningless set of findings from the conjoint analysis." Lonial, Subhash, Dennis Menezes, and Selim Zaim, "Identifying Purchase Driving Attributes and Market Segments for PCs using Conjoint and Cluster Analysis," 2 *Journal of Economic and Social Research* (2000) 19-37, 24.

<sup>21</sup> See, e.g., Hanley, Nick, Susana Mourato, and Robert E. Wright, "Choice Modelling Approaches: A Superior Alternative for Environmental Values?" 15 *Journal of Economic Surveys* (2001) 435-462, 449 and Herfert, Matthias, and Pierfrancesco La Mura, "Estimation of Consumer Preferences via Ordinal Decision-Theoretic Entropy", working paper no. 64, Leipzig Graduate School of Management (2004).

38. In summary, economists have pointed out limitations to the conjoint analysis approach. These limitations undermine the use of conjoint analysis as a basis for a calculation of damages in litigation. Dr. Hauser has not addressed these well-known shortcomings and therefore he has not established that the methodology he employs in this particular instance is reliable.

### **III. DR. HAUSER'S SURVEY DATA DO NOT RELIABLY REFLECT CONSUMER PREFERENCES**

39. In my analysis of Dr. Hauser's survey, I find that the consumer preferences implied by the survey do not appear to be consistent with basic economic principles. Further, my own analysis of his survey results reveals that small changes in prediction methodology result in highly variable estimates of 'light' cigarette smokers' willingness-to-pay. Finally, Dr. Harris's implementation of Dr. Hauser's survey results yields implausibly high damage estimates for consumers who believe that the health risks of smoking 'light' cigarettes are no lower than the health risks of smoking 'regular' cigarettes. These consumers represent almost 40 percent of the respondents to Dr. Hauser's survey. Economic theory predicts that they would place a zero value on the difference in health risks between smoking 'light' cigarettes and smoking 'regular' cigarettes. However, the imputed values for these respondents alone yield damage estimates almost as large as the estimates based on the partworths imputed for the respondents in total. Taken together, these results indicate that Dr. Hauser's survey methodology is questionable and consequently does not provide a reliable basis for predicting consumer demand for 'light' cigarettes.

**A. Dr. Harris's Use of Dr. Hauser's Estimated Partworths Produces Estimated Preferences that are Inconsistent with Economic Theory and Yields Unreliable Estimates of Damages**

40. Dr. Harris's implementation of Dr. Hauser's methodology yields estimates of zero marginal utility of income over some ranges of price change for some consumers. In other words, contrary to basic economic theory and a large body of empirical evidence on consumer demand, some consumers are assumed not to care at all about a price increase or a price decrease. For example, out of 627,000 estimates of partworths that were the basis for Dr. Harris's analysis, 48.8 percent of observations indicate no gain in utility from a decline in cigarette prices to 20 percent below the 'usual' level, and 40 percent of observations indicate no gain in utility from a decline in cigarette prices from 20 percent to 50 percent below the 'usual' level. Similarly, 16 percent indicate no loss in utility from an increase in cigarette prices to 20 percent above the 'usual' level, and 30 percent of observations indicate no loss in utility from an increase in cigarette prices from 20 percent to 50 percent above the 'usual' level. In all, more than 71 percent of the observations underlying the 'preferences' on which Dr. Harris relies exhibit no effect of a change in income on purchases -- "zero marginal utility of income" in the jargon of economists. This evidence is at odds with a large economic literature on consumer demand.<sup>22</sup>

41. Consumers' marginal utility of money is highly critical to Dr. Harris's damage calculations, since he translates the value of health benefits into money damages based on marginal utility estimates. Therefore, the unreliability of these estimates indicates that Dr. Harris's damage measures are flawed.

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<sup>22</sup> Consumers should prefer to have more goods and choices to fewer goods and choices. A lower price for one good makes it possible to buy more of all goods.

42. The unreliability of Dr. Hauser's survey estimates is also evidenced by the highly variable measures of damages that are generated by the different metrics of marginal utility in the survey. Dr. Harris's report calibrates the value to a respondent of a change in perceived health risk as a percent of the value to the respondent of a *decrease* in price.<sup>23</sup> According to economic theory, the result should be the same had he calibrated the value to a respondent of a change in perceived health risk as a percent of the value to the respondent of an *increase* in price. However, if Dr. Harris had used the estimated difference in respondents' utility from an increase in the price of cigarettes,<sup>24</sup> the estimated average diminution in value (for the case in which the 'light' cigarettes offered health risks that 'are the same as 'regular' cigarettes') would fall by more than 50 percent: 24.29 percent as compared to 50.12 percent reported by Dr. Harris.<sup>25</sup> As a consequence, the estimated total damages would also fall by more than 50 percent. See Table 1.

**B. Dr. Hauser's Predicted Partworths are Inconsistent with Respondents' Stated Preferences and Beliefs.**

43. Inconsistent results also indicate that Dr. Hauser's survey does not accurately measure respondents' preferences. If Dr. Hauser's survey results accurately measured respondents' preferences, then the preferences based on estimated partworths should be consistent with respondents' answers to questions about perceptions of health risks prior to being presented with choice questions. However, we find that the respondents' stated beliefs pre-survey are not always consistent with the preferences that

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<sup>23</sup> Harris Report, ¶10-13.

<sup>24</sup> In fact, in calculating willingness-to-pay, it is more appropriate to estimate how much more the consumers are willing to pay for 'safer light' cigarettes than how much less the consumer would want to pay for 'unsafe light' cigarettes.

<sup>25</sup> Harris Report, Table 1, page 9.

Dr. Hauser imputes for them based on estimated partworths. For example, the top panel of Table 2 shows that 386 of the 627 respondents indicated in the pre-survey that they believed that smoking 'light' cigarettes was less risky than smoking 'regular' cigarettes. Yet for 37 (or roughly 10 percent) of those respondents, the partworth estimates based on the survey indicate that respondents preferred the health profile of 'regular' cigarettes to the health profile of 'light' cigarettes. Similarly, the bottom panel of Table 2 shows that 330 respondents indicated in the pre-survey that they believed that smoking 'ultra-light' cigarettes to be less risky than smoking 'light' cigarettes. However, for 182 (or roughly 55 percent) of these respondents, the partworth estimates indicate that they preferred the health profile of 'light' cigarettes to that of 'ultra-light' cigarettes. The same phenomenon can be observed among those who compared the health profiles of 'ultra-light' and 'regular' cigarettes. See the middle panel of Table 2. In short, it appears that Dr. Hauser's choice-based analysis, on which Dr. Harris relies for computing class-wide damages, does not accurately measure consumer preferences, and thus calls into question its reliability as a basis for projecting damages.

**C. Estimates of Willingness-to-Pay For Consumers Who Believe the Health Risks of Smoking 'Light' Cigarettes are No Lower than the Health Risks of Smoking Regular Cigarettes Further Reveal the Unreliability of the Damage Estimates**

44. As I already have noted, Dr. Hauser's choice-based methodology for estimating willingness-to-pay yields unreliable measures for health risk partworths. As a result, Dr. Harris's reliance on those measures for calculating damages yields substantial damage estimates for respondents who stated that they believed 'light' cigarettes were at least as risky as 'regular' cigarettes. Economic theory implies that these consumers' choices were not affected by any alleged safety misinformation -- a consumer who

already believes that smoking 'light' cigarettes is not less risky than smoking 'regular' cigarettes should not be affected by information indicating that smoking 'light' cigarettes is not less risky than smoking 'regular' cigarettes - and, therefore, their imputed damages should be zero. Not only does Dr. Harris's damages methodology fail to yield a zero damage estimate for these consumers, it yields substantial damages for these consumers. When only the partworth estimates for 241 respondents who stated that they believed smoking 'light' cigarettes was not less risky than smoking 'regular' cigarettes are used to estimate average loss of value and associated damages, estimated damages are not substantially lower than estimated damages based on the partworths imputed on the basis of the entire sample of respondents.

45. Table 3 shows the results of damage calculations based on applying Dr. Harris's methodology separately for consumers who believe that the health risks of smoking 'light' cigarettes are no lower than the health risks of smoking 'regular' cigarettes and those who do believe that the health risks of smoking 'light' cigarettes are lower than the health risks of smoking 'regular' cigarettes for the case where smoking 'light' cigarettes offer health risks that are the same as smoking 'regular' cigarettes. Table 3 shows that applying only the partworths estimated for the consumers who do not believe that smoking 'light' cigarettes is safer yields estimated total damages that are only 15.6 percent smaller than estimated total damages based on the partworths for consumers who believe that smoking 'light' cigarettes is safer than smoking 'regular' cigarettes. In other words, responses from survey participants who did not believe smoking 'light' cigarettes to be any safer than smoking 'regular' cigarettes lead to damage calculations nearly as large as those based on responses from participants who

believed smoking 'light' cigarettes to be safer than smoking 'regular' cigarettes. This result reveals a major flaw in the damage methodology and underlying data employed by Dr. Harris, and shows that Dr. Harris provides unreliable estimates of consumer harm.

**IV. DR. HARRIS'S ESTIMATES OF CLASS DAMAGES ARE FLAWED EVEN IF THE SHORTCOMINGS OF DR. HAUSER'S SURVEY ARE IGNORED**

**A. Overview of Dr. Harris's Methodology**

46. In his expert report from September 6, 2005, Dr. Harris employs the estimated partworths from Dr. Hauser's conjoint analysis to perform damage calculations.<sup>26</sup> Dr. Harris uses the partworths for two of the four product attributes that Dr. Hauser analyzes: health risk (three partworths per respondent – greater than 'regular', equal to 'regular', equal to 'light') and price (five partworths per respondent – 50 percent less than usual, 20 percent less than usual, same as usual, 20 percent more than usual, 50 percent more than usual). Dr. Harris refers to his analysis as a 'loss in value' calculation. He computes loss in value by normalizing (i.e., dividing) Dr. Hauser's health risk partworths by Dr. Hauser's price partworths, thus enabling him to express the alleged 'utility loss' suffered by consumers as a percent of the respondent's 'usual' price.<sup>27</sup>

47. For illustrative purposes, I focus on the loss in value that Dr. Harris claims that members of the class suffered because they were induced by the alleged 'light cigarette fraud' to underestimate the health risks of smoking 'light' cigarettes relative to

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<sup>26</sup> Dr. Harris states that he received a file containing 1,000 draws for each of 627 survey respondents, or 627,000 total draws. These data were part of the output generated from the AMS survey implemented by Dr. Hauser. Harris Report (p. 2-3).

<sup>27</sup> Dr. Harris's methodology of measuring tradeoffs between cigarette characteristics is unorthodox because it uses imprecise theoretical constructs, as cigarette characteristics are measured on a scale that varies by respondent. For example, prices paid by respondents vary based on location of purchase; therefore 20% increases in price represent different amounts to different respondents.



smoking 'regular' cigarettes, if those risks are actually the same. Dr. Harris begins by subtracting the partworth estimate for each respondent for health risks 'equal to 'regular'' from the partworth estimate for the same respondent for health risks 'equal to light.'<sup>28</sup> The resulting difference is intended to measure (in units of utility) how much the respondent values the allegedly misperceived benefit of reduced health risk from smoking 'light' cigarettes instead of 'regular' cigarettes. Dr. Harris then calculates the difference between the respondent's partworth for 'current, or same, price' and the partworths for lower prices, in order to measure how much the respondent values various price reductions. Dr. Harris then divides the health risk partworth difference by the price level partworth difference, thereby expressing the health risk partworth difference as a percent reduction in the respondent's 'usual price'. The result is Dr. Harris's 'loss in value', which forms the foundation for his damage calculations.

48. Dr. Harris does not measure any respondent's actual level of preference, i.e., the dollar value that the respondent puts on the allegedly misperceived health risks of smoking 'light' cigarettes. Nonetheless, Dr. Harris weights each respondent's 'loss in value' by the number of packs of cigarettes the respondent smokes and uses bootstrap statistical procedures to estimate a class-wide average 'loss in value' and a corresponding standard deviation. Applying these to market sales data, Dr. Harris arrives at his damage calculations.<sup>29</sup>

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<sup>28</sup> Technically, Dr. Harris is calculating 'willingness-to-accept', not 'willingness-to-pay.'

<sup>29</sup> Because Dr. Harris's ultimate goal is to determine a percent reduction in price to apply to aggregate expenditures on 'light' cigarettes, the proper weighting scheme would be based on respondents' expenditures on cigarettes, not the number of packs smoked. Because the number of packs smoked is likely to be inversely correlated with price, Dr. Harris's weighting scheme contains bias and contributes further to the unreliability of projected Class damages.

**B. Dr. Harris's Analysis Does Not Address the Question of Economic Harm to the Class**

49. Dr. Harris's report does not address the effects that the alleged tobacco company conspiracy had on economic harm to the Class. The alleged conspiracy could have caused economic harm to 'light' cigarette smokers only if, in a world absent the purported bad acts, 'light' cigarette prices would be lower or 'light' cigarette smokers would behave differently. Without addressing whether 'light' cigarette prices would have been lower or 'light' cigarette smokers' behavior would have been different, Dr. Harris's analysis does not provide evidence of class harm emanating from the alleged conspiracy.

50. Therefore, even if Dr. Harris's damage estimates were not flawed due to unreliable survey data and unreliable estimates of willingness-to-pay, they are an improper measure of damages, because they do not address whether anyone would have behaved differently or whether 'light' cigarette prices would have been lower in a but-for world.

51. In computing damages, Dr. Harris ignores the fact that the smoking behavior of most respondents should have been unaffected by the alleged conspiracy, because the majority of respondents (approximately 55 percent) in Dr. Hauser's survey indicate that they did not believe that, or did not care, whether smoking 'light' cigarettes was less risky than smoking 'regular' cigarettes. If the survey is reliable, these respondents either were not fooled by the alleged misinformation or it was not important to them; thus, the behavior of these consumers should not have been affected by the alleged conspiracy. And for at least some consumers who may have been 'fooled', preference for the taste of 'light' cigarettes might be so strong that additional information

provided by tobacco companies on the health risks of 'light' cigarettes would not have altered their smoking behavior significantly.

52. These conclusions are supported by the evidence from the marketplace. Despite increased attention to the relative health risks of smoking 'light' cigarettes beginning with the 1981 Report of the Surgeon General,<sup>30</sup> there has been no substantial drop in the sales of 'light' cigarettes. Instead, there was an increase in the share of 'light' cigarettes sold.<sup>31</sup> These findings suggest that many 'light' cigarette smokers would not have altered their smoking behavior in the absence of the alleged bad acts.

**C. Dr. Harris's Analysis Does Not Provide an Evidentiary Basis to Assess the Effect of the Alleged Conspiracy on 'Light' Cigarettes Prices**

53. Dr. Harris's analysis is based on the assumption that some consumers' willingness-to-pay for 'light' cigarettes would have been lower in a but-for world. Even if this contention were correct, it does not follow that 'light' cigarette prices would have been lower in a but-for world.

54. The effect that a hypothetical reduction in consumers' willingness to pay for 'light' cigarettes would have on market prices for cigarettes depends not only on the level of demand but also on the supply characteristics of the market, particularly on the nature of competition in the tobacco industry. Optimal pricing decisions by cigarette suppliers in response to a decline in the demand for 'light' cigarettes could lead to higher

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<sup>30</sup> The 1981 Surgeon General's report found that compensatory changes in smoking behavior diminished the otherwise potential health benefit from reduced tar and nicotine cigarettes. See *The Health Consequences of Smoking: The Changing Cigarette*, U.S. Dept. of Health and Human Services, 1981.

<sup>31</sup> Federal Trade Commission Cigarette Report for 2003 (2005).

or unchanged 'light' cigarette prices.<sup>32</sup> Dr. Harris's analysis does not address this issue.

55. The reduced demand for 'light' cigarettes could lead to a somewhat increased demand for 'regular' cigarettes, because consumers who switched to 'light' cigarettes because they believed they were safer than 'regular' cigarettes will switch back. Because most cigarette companies market both 'light' and 'regular' versions of their cigarettes, they will take into account the substitution between them when setting prices. A single firm will recognize that if it cuts price in order to sell more of product A, it will also sell less of substitute B. In the hypothetical but-for world, in which 'light' and 'regular' cigarettes are considered to be equally safe, they could be even closer substitutes than they are in the actual world. This means that tobacco companies would be hesitant to reduce the price of 'light' cigarettes in the but-for world, because what they gained in additional sales of 'light' cigarettes would be at least partially offset by a decline in the sales of 'regular' cigarettes. In order to reliably predict what cigarette companies would do in the "but-for" world, one would have to understand both the current level of cross-elasticity of demand between 'light' and 'regular' cigarettes, and how that would be affected by new information regarding the safety of 'light' cigarettes. Dr. Hauser's report provides no such analysis.

56. Further, even ignoring the demand-side substitution between 'light' and 'regular' cigarettes, whether or not lower demand for 'light' cigarettes would have led to lower prices for 'light' cigarettes in the but-for world depends not only on the level of

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<sup>32</sup> As is explained below, economic theory does not preclude the possibility that prices could be higher in the but-for world. For example, if marginal smokers are the ones who highly valued the health characteristics of light cigarettes, it would be predominantly these smokers who would stop smoking light cigarettes in response to additional health information. This would leave predominantly the high-value smokers remaining as purchasers, which could cause light cigarette prices to rise.

demand, but also the price elasticity of demand for 'light' cigarettes in the but-for world. For example, if only those smokers of 'light' cigarettes who valued the taste characteristics of 'light' cigarettes least in the actual world would have smoked 'regular' cigarettes or not smoked at all in the but-for world, optimal prices for 'light' cigarettes in the but-for world might have been higher, because only high demand, low elasticity 'light' cigarette smokers would have been in the market.<sup>33</sup>

57. In summary, the likely effect of the alleged conspiracy on market prices depends on the characteristics of supply and demand in the market. Because Dr. Harris's analysis does not address the supply side of the market at all (and examines only a limited portion of the demand side), it cannot reliably predict the effect of the alleged conspiracy on the price of 'light' cigarettes and would not preclude a higher price for 'light' cigarettes in the but-for world.

58. Moreover, Dr. Harris's analysis ignores several key observations that imply 'light' cigarette prices would be little changed in a 'but-for' world. First, as I already have explained, despite the publication of the 1981 Report of the Surgeon General, which focused on the fact that any potential health benefit from reduced tar and nicotine cigarettes was offset by compensatory changes in smoking behavior, the sales of 'light' cigarettes have not declined and their share of all cigarettes sold continued to increase. Second, the majority of respondents to Dr. Hauser's surveys indicated either that they didn't care whether or didn't believe that smoking 'light' cigarettes was less risky than

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<sup>33</sup> Alternatively, depending on the natures of the demand curve and marginal cost, price might stay the same following a demand decrease. This would be so if demand were linear, the decrease involved a rotation inwards of the demand curve, and marginal cost were constant.

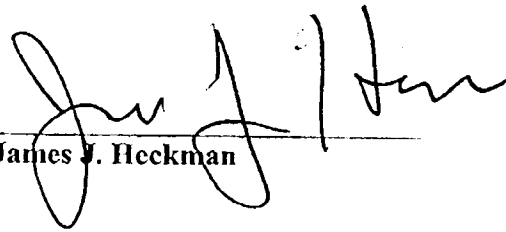
smoking 'regular' cigarettes.<sup>34</sup> If these responses represent the beliefs of 'light' smokers generally, then willingness-to-pay for the majority of 'light' smokers should not have been greatly affected by the alleged misinformation about the health risks of 'light' cigarettes. Third, many different types of cigarettes, with varying nicotine and tar content, currently are available, yet consumer prices for these cigarettes do not greatly vary based on these characteristics.<sup>35</sup>

59. Fifth, even ignoring the joint pricing decision for 'light' and 'regular' cigarettes, a reduction in willingness-to-pay for 'light' cigarettes by some consumers in the but-for world could lead to higher prices for 'light' cigarettes. The ultimate effect on prices would depend on which consumers had reduced willingness-to-pay. In particular, if 'light' cigarette smokers who value smoking the least quit smoking in the but-for world, cigarette firms could increase profits by charging *higher* prices, as they focused on sales only to high demand smokers. Without reliable evidence on the structure of demand and which smokers would not smoke, absent the alleged conspiracy, Dr. Harris's analysis provides no reliable information on relative prices of 'light' cigarettes in a but-for world.

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<sup>34</sup> Approximately 84 percent of the respondents to the Time Study survey that Dr. Hauser undertook in connection with this litigation indicated that they believed the health risk of smoking 'light' cigarettes is the same as or higher than the health risk of smoking 'regular' cigarettes. In the draft report on these data, which he did not submit, he reasons that this is comparable to the 86 percent of respondents to the survey that forms the basis for the Hauser Report, that rate the risk of smoking 'light' cigarettes to be not less than 75 percent of the risk of smoking 'regular' cigarettes. Hauser December 16, 2005 Draft Report (big), ¶ 81 (Exhibit 37, Hauser Deposition, 5/19/2006).

<sup>35</sup> For example, the prices of cigarettes sold by online websites do not differ for regular, medium, or light cigarettes of a particular brand. See, for example, <http://cigarettes-store.justcigarette.com>.



James J. Heckman

**Dated: May 25, 2006**

**Table 1**

**Damage Calculations Based on Dr. Harris's Loss of Value Approach  
Estimating Willingness-To-Pay on the Basis of Respondents' Utility Loss  
From Increasing the Price of Cigarettes**

<b>Manufacturer</b>	<b>Expenditures (\$MM)</b>	<b>'Equal to 'regulars'' Case</b>		
		<b>Mean</b>	<b>90% Confidence Interval</b>	
			<b><i>Lower Limit</i></b>	<b><i>Upper Limit</i></b>
Liggett	4,619	1,122	997	1,258
Lorillard	12,777	3,104	2,758	3,480
Phillip Morris	155,227	37,705	33,507	42,284
Reynolds	114,011	27,694	24,610	31,056
<b>Total</b>	<b>286,634</b>	<b>69,624</b>	<b>61,872</b>	<b>78,078</b>

Source: Expenditures - Harris report, Table 2, page 11.



Table 2

**Respondents' Pre-Survey Beliefs and Survey Preference Imputations for Health Risk**

<i>Pre-survey:</i>	<i>Survey: Estimated utility (partworth) of health risk of 'light' versus 'regular' cigarettes</i>		
Health profile of 'light' versus 'regular' cigarettes	'Light' preferred to 'regular'	'Regular' preferred to 'light'	Total
'Light' less risky than 'regular'	349	37	386
'Light' the same as 'regular'	211	22	233
'Light' riskier than 'regular'	7	1	8
Total	567	60	627

<i>Pre-survey:</i>	<i>Survey: Estimated utility (partworth) of 'ultra-light' versus 'regular' cigarettes</i>		
Health profile of 'ultra-light' versus 'regular' cigarettes	'UL' preferred to 'regular'	'UL' the same as 'regular'	'Regular' preferred to 'UL'
'UL' less risky than 'regular'	323	1	73
'UL' the same as 'regular'	164	0	54
'UL' riskier than 'regular'	7	0	5
Total	494	1	132

<i>Pre-survey:</i>	<i>Survey: Estimated utility (partworth) of 'ultra-light' versus 'light' cigarettes</i>		
Health profile of 'ultra-light' versus 'light' cigarettes	'UL' preferred to 'light'	'Light' preferred to 'UL'	Total
'UL' less risky than 'light'	148	182	330
'UL' the same as 'light'	102	177	279
'UL' riskier than 'light'	9	9	18
Total	259	368	627

Note: The pre-survey comparison of health profile of 'light' versus 'regular' cigarettes is based on responses to the question: "Assuming that regular cigarettes have a health risk value of 100, what number on this scale is the level of health risk you perceive for smoking light cigarettes?" (Hauser Exhibit D, page E19).

A belief that 'light' ('ultra-light') cigarettes are less risky than 'regular' ('light') cigarettes is indicated by a value of less than 100. A value of 100 indicates a belief that the risks are equal. And a value greater than 100 indicates that the respondent believes that 'light' ('ultra-light') cigarettes are riskier than 'regular' ('light') cigarettes.

Table 3

**Damage Calculations Based on Dr. Harris's Loss of Value Approach,  
Across Respondents with Different Stated Beliefs about Health Risks of 'Light'  
Cigarettes**

Manufacturer	Expenditures (\$MM)	'Equal to 'regulars'' Case		
		Mean	90% Confidence Interval	
			Lower Limit	Upper Limit
<b>Health risks of 'light' cigarettes are lower than that of 'regular' cigarettes</b>				
Liggett	4,619	2,457	2,267	2,658
Lorillard	12,777	6,796	6,272	7,354
Phillip Morris	155,227	82,567	76,200	89,342
Reynolds	114,011	60,643	55,967	65,620
<b>Total</b>	<b>286,634</b>	<b>152,463</b>	<b>140,706</b>	<b>164,974</b>
<b>Health risks of 'light' cigarettes are the same or higher than that of 'regular' cigarettes</b>				
Liggett	4,619	2,074	1,827	2,313
Lorillard	12,777	5,738	5,054	6,398
Phillip Morris	155,227	69,712	61,406	77,733
Reynolds	114,011	51,202	45,101	57,093
<b>Total</b>	<b>286,634</b>	<b>128,726</b>	<b>113,389</b>	<b>143,538</b>

Source: Expenditures - Harris report, Table 2, page 11; Hauser Exhibit D, page E19.

Note: The mean average diminution in value in the group of consumers who believe health risks of 'light' cigarettes are smaller than that of 'regular' cigarettes is 53.19%; 90% confidence interval is [49.09%; 57.56%]. The mean average diminution in value in the group of consumers who believe health risks of 'light' cigarettes are the same or higher than that of 'regular' cigarettes is 44.91%; 90% confidence interval is [39.56%; 50.08%].